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Barnes & Thornburg  
P.O. Box 2786  
Chicago, IL 60690-2786

EXAMINER
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PRITCHETT, JOSHUA L

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/975,830

Applicant(s)

SAVORY ET AL.

Examiner

Joshua L Pritchett

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 21-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 21-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

This action is in response to the Response filed July 25, 2003 all the arguments in the Response have been considered.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 21 is rejected under 35 U.S.C. 102(e) as being anticipated by Shieh (US 6,384,956).

Shieh discloses a device for applying a variable differential group delay to the signal at an input of the device, and for providing the modified signal at an output of the device, the device comprising at least four birefringent elements (100, 102, 104, 106) arranged between the input and output of the device (Fig. 1), and having principal axes (Fig. 1), each element being associated with a control device (116, 118, 120, 122) for controlling the orientation of the PSPs of the signal in the element relatively to the principal axes of the element (col. 3 lines 40-41) and

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a controller (124) for controlling the control devices such that for all settings of the device at most two of the birefringent elements have orientation other than 0 or 45 degrees (col. 3 lines 15-20). Shieh states that the principal axes of the birefringent elements are chosen arbitrarily therefore any element at any given time could have any degree of rotation based upon the choice of the principal axes.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-9 and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shieh (US 6,384,956) in view of Noe "Polarization Mode Dispersion Compensation at 10, 20, and 40 Gb/s with Various Optical Equalizers."

Regarding claim 1, Shieh teaches a devices for applying a variable differential group delay to a signal at an input of the device, and for providing the modified signal at an output of the device, the device comprising first (100), second (102) and third (104) birefringent elements arranged in order between the input and output of the device (Fig. 1) and having a first, second and third differential group delay (col. 3 lines 20-24) and having principal axes (Fig. 1). Shieh

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further teaches means for controlling (124), in each birefringent element, the orientation of the PSPs of the signal in the element relative to the principal axes of the element (Fig. 1), the control being such that a change in orientation between the first and second elements is equal to a change in the orientation between the second and third elements (col. 4 lines 16-20). Shieh also shows in Fig. 1 that the second element (102) rotates in the opposite direction of the first (100) and third (104) elements. Shieh discloses that two of the birefringent elements may be synchronized such that the setting of one element would also adjust the setting of other elements, therefore the claimed change relationship can be programmed into the controlling means of the Shieh reference. One would have been motivated to have such a relationship between the elements for the purpose of effecting equal change in both the S and P polarization axes. Shieh lacks reference to the elements having a 1:2:1 delay ratio. Noe teaches the use of three birefringent elements with a delay ratio of 1:2:1 (page 1612 col. 2). Noe discloses the use of  $\lambda/4$ ,  $\lambda/2$ , and  $\lambda/4$  plates, which would meet the claimed delay ratio. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the Shieh elements have the delay ratio taught by Noe for the purpose of creating a greater delay in a shorter optical path length.

Regarding claims 2 and 22, Shieh teaches the invention as claimed but lacks reference to the use of the device from claim 1 in a polarization mode dispersion compensator. Noe teaches the use of a polarization mode dispersion compensator (PMD) using three birefringent elements with a 1:2:1 delay ratio (page 1612 col. 2). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the Shieh reference be used in a

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polarization mode dispersion compensator as taught by Noe for the purpose of having low signal degradation in an optical fiber over a long distance.

Regarding claim 3, Shieh teaches a means for varying the orientation of the principal axes of the second birefringent element (118) relative to the first birefringent element and for varying the orientation of the third birefringent element (120) relative to the second birefringent element. Shieh further teaches the varying means is controlled such that the angle of the principal axes of the second birefringent element relative to the first birefringent element is equal and opposite to the angle of the principal axes of the third birefringent element relative to the second birefringent element and is discussed in the rejection of claim 1.

Regarding claim 4, Shieh teaches the varying means comprising means for rotating the first, second and third birefringent elements (Fig. 1).

Regarding claim 5, Shieh teaches the rotating means is adapted to rotate the first birefringent element by a selected angle in a first sense, to rotate the second birefringent element by the selected angle in a second, opposite sense, and to rotate the third birefringent element by the selected angle in the first sense (Fig. 1, col. 4 lines 16-20).

Regarding claim 6, Shieh teaches the angle can vary between 0 and  $\pi/4$  radians (Fig. 1). Fig. 1 shows that the angle each element is rotated is between 0 and 45 degrees, which is equivalent to  $\pi/4$  radians.

Regarding claim 7, Shieh teaches the control means comprising a first means for varying the orientation of the PSPs of the signal between the first and second birefringent elements (118), a second means for varying the orientation of the PSPs of the signal between the second and third birefringent elements (120), wherein the first and second means are controlled such that

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they vary the orientation by equal and opposite amount and are discussed in the rejection of claim 1.

Regarding claim 8, Shieh teaches the varying means comprises a polarization rotator (col. 3 lines 40-41). Shieh discloses that varying means 118 and 120 cause the birefringent elements 102 and 104 respectively to rotate, because elements 102 and 104 polarize light varying means 118 and 120 may be considered polarization rotators.

Regarding claim 9, Shieh teaches a polarization controller (116) at the input to the device for selecting the orientation of the PSPs of the signal in the first birefringent element (100) relatively to the principal axes of the first birefringent element (Fig. 1).

Regarding claim 23, Shieh teaches the birefringent elements, each have the same DGD (col. 3 lines 5-7).

Regarding claim 24, Shieh teaches the device provides a net DGD between 0 and n times the DGD of each element (col. 4 lines 5-9, col. 3 lines 9-12). Shieh discloses that each element introduces standard  $\pi/2$  phase retardation.

Regarding claim 25, Shieh teaches the device comprising six birefringent elements (col. 4 lines 5-9), the control device of the first birefringent element (116) comprising a polarization controller and the control device of the second to sixth birefringent elements (118, 120, etc.) comprising a polarization rotator (col. 3 lines 40-41).

### ***Response to Arguments***

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Applicant's arguments filed July 25, 2003 have been fully considered but they are not persuasive.

On pages 1-2 of Response, applicant argues that Shieh does not teach differential group delay, but instead teaches a polarization controller. The claim limitation that deals with differential group delay is present only in the claim preamble and therefore is not given significant patentable weight. Furthermore, Shieh teaches all the claimed structure elements of the current invention and therefore would be capable of performing any task the current invention is capable of performing including differential group delay. Shieh states that the quarter-wave plates introduce phase delay (col. 2 line 21). Therefore the group of four elements would introduce a group delay. Applicant further argues that Shieh does not teach the four elements being birefringent elements. Shieh does teach that the four elements are birefringent elements (col. 2 lines 21-24). Shieh teaches that the, "elements causes variation in the birefringence."

On pages 2-3 of Response, applicant argues that the claimed 1:2:1 delay ratio of the current invention is not taught by the quarter:half:quarter sequence of Noe. The examiner disagrees. Based on the teachings of Shieh as stated above a quarter-wave plate introduces phase delay in the optical signal, and the use of a half wave plate would inherently introduce twice the phase delay as a quarter wave plate. Further support for the fact that the half wave plate introduces twice the phase delay as a quarter wave plate comes from the commonly known and used practice of forming a half wave plate by combining two quarter wave plates. Thus the quarter:half:quarter wave plate sequence taught by Noe does meet the claimed 1:2:1 delay ratio between the elements claimed in the current invention. Applicant further argues that the Noe



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reference does not teach the equal and opposite changes claimed in the current invention. The examiner agrees; however as stated in the Previous Office Action (Paper No. 11) the claim limitation dealing with the equal and opposite change is taught by Shieh.

### *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua L Pritchett whose telephone number is 703-305-7917. The examiner can normally be reached on Monday - Friday 7:00 - 3:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 703-305-0024. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JLP



DREW DUNN  
SUPERVISORY PATENT EXAMINER